

trustworthy—and proposes an instrument in which a weight drives a clock-train furnished with a centrifugal speed-indicator. The changes of apparent weight of the driver caused by the earth's up-and-down motion are to cause fluctuations in the speed of the driven train, which are to be recorded in conjunction with the time. The plan is, I think, new, but a less direct method of measuring vertical movement could scarcely be imagined. The fluctuations in speed will follow the changes of pull exerted by the driver with diminished amplitude and retarded phase, and superposed on them there will be fluctuations following no rule, due to inconstant friction and to mechanical imperfection of the train, as well as the continuous acceleration which follows the starting of the mechanism. To interpret the records would be altogether impracticable.

The design of a seismograph is a problem in applied dynamics which has of late years received a number of very satisfactory solutions. Of instruments capable of determining earthquake movements in absolute measure, and with reasonable exactness, there is now no lack; and it would be a pity if their wider employment were in any way retarded by the publication, on the authority of Dr. Johnston-Lavis, of suggestions which may fairly be said to lie outside the sphere of practical seismology.

University College, Dundee, October 27 J. A. EWING

### The Sky-Glows

THE description of the sky-glows as seen by Prof. A. S. Herschel may justify an account of some seen near the University of Virginia, Virginia, during the past spring, from notes made at that time.

February 25.—For several days before this date there were (if one may so call them) the normal glows at and after sunset. On this day there was seen a single pink ray with well-defined edges, about 4° broad, perpendicular to the western horizon, reaching half way to the zenith.

March 24.—Ten minutes before sunset, the sun being behind a small cloud, the bright oval “glare” in the west, which preceded nearly all the after-glows, was seen with its centre at an elevation of 15° (all these heights are rough estimates). It was 10° in diameter, and was surrounded by a band of a hazy reddish ashen colour (this band was usually seen with the “glare”) about 5° wide, which deepened in tint towards the horizon, and there spread out on each side of the “glare” so as to form a somewhat triangular support for it. At 6.30 the sun set. No colour had yet appeared on the eastern horizon. The “glare” now seemed almost triangular in shape, with the deepest ashen tints at the lower corners. As the sun descended, the “glare” diminished in intensity from the apex of the triangle. At 6.35 there was a ruddy colour on the eastern horizon, which spread in a triangular shape, apex upward, to a height of 25° to 30°, and at 6.40 was an exact image of the “glare” in the west, except that there were clear red tints instead of ashen, which were deepest at the lower corners of the triangle. The colour triangle then gradually rose from the eastern horizon, apparently following the sun, till at 6.48 the pink tint appeared in the western sky, increased in intensity, and was deepest at an elevation of 60°. The colour in the east was now gone. (Several attempts were made to observe the passage of colour across the zenith, but in no case was there success.) The western horizon was dazzling topaz-yellow, above the yellow pale blue, then faint pink to the deepest pink. The pink gradually descended toward the horizon, and when within 20° merged into the ordinary sunset colour at 7.0. The general phases of the glow were as follows:—Triangular ashen haze with oval “glare” in west, base of triangle on the horizon at sunset. Ten minutes later, triangular ruddiness in east, with base on the horizon. Another ten minutes, pink in the west. Ten minutes more, colour disappears. This succession was also noticed on March 15. On March 4 the glow in the west reached its most intense colour twenty minutes after sunset, but lasted twenty minutes, disappearing forty minutes after sunset.

On this evening (March 24) at 6.45, a cloud in the western sky, there being then no pink there, at an elevation of 35°, was coloured pale pea-green. This colour of the clouds floating at an elevation of 35° was seen on other days, while the clouds above and below retained their ordinary appearance.

March 26.—After the same phenomena as detailed in the last, even to the colour of the clouds, twenty minutes after the disappearance of the first glows, at 7.20 there was a pale rose-glow at an elevation from the western horizon of 30° to 35°, which

reached almost to the Pleiades, of which six were then visible. This second glow lasted about twenty minutes, and seemed to descend to the horizon. It was almost identical with the first, but fainter.

March 29.—Same as preceding, without second after-glow; tints extended 60° to 70° from horizon.

These after-glows were noticed more or less during April, July, and September, and here in Cambridge during this month there have been several vivid displays.

W. G. BROWN  
Harvard College, Cambridge, Mass.,

October 23

I BEG to inclose you an extract from a letter lately received by me from my cousin, Mr. Leeming, in the hope that it may interest some of your readers.

ELLEN A. DAY

Greycoat Hospital, Westminster, October 24

*Extract from a Letter written by Thomas Leeming, Surgeon and Naturalist on Board H.M.S. “Gulnare,” on the Admiralty Survey off Newfoundland*

“Gallois, Hermitage Bay, Newfoundland,  
September 12, 1884

“There is one thing I have more than once forgotten to mention to you, that is, an unusual appearance in the sky there has been now for some months, which I think must be connected with the red sunsets of last winter. In the finest weather the sun has always about it a haze (not watery) extending some 20° or 30°, white in the day-time, but as the sun nears the horizon the sky has a pale salmon or ochrey tint. In the immediate neighbourhood of the sun, the sky is of a vivid whiteness. This appearance continues some time after sunset. I have tried more than once to reproduce this effect, with water-colours, but without success. Let me know if you have observed or heard of anything of the same kind. I may also mention that there has been until lately a great scarcity of stars; even on the fairest and darkest nights very few visible under the third magnitude, and the Milky Way scarcely to be seen at all. Things, however, are mending in this respect.”

### Peculiar Ice Forms

WALKING up from Chamounix to the Montanvert a fortnight ago, I came upon a form of ice which I think can hardly be of common occurrence, as I have not met with any description of it, and have only once before seen it, and then also on the same mountain side, and under similar conditions of season and weather.

The bank, which in this particular spot slopes at an angle of about 45°, and faces the north, is bare of vegetation for some 30 feet in depth, and 100 to 120 feet in length, the hillside above being clothed with moss, ferns, and the usual undergrowth. This bare slope was almost covered with a coating of ice nearly four inches in depth, and of very curious structure, being formed in four layers, the three upper layers each about an inch in depth, and the lowest, which rested on the soil, being from five-eighths to three-quarters of an inch. Each layer was composed of an aggregation of filaments or elongated crystals, one-sixteenth of an inch and downwards in diameter, and all of a length equal to the thickness of the layer, ranged side by side like organ-pipes or basaltic columns, and with pyramidal ends; the bottom points of one layer resting on the top points of the one below, so that the layers could be easily detached one from the other. The whole mass was pierced by vertical cylindrical cavities from half to a quarter of an inch or less in diameter, and in most cases penetrating from top to bottom, so that a pencil-case could be dropped through endways. A horizontal section presented somewhat the appearance of Gruyère cheese, minus the colour of course, and with the solid part showing the crystalline form described above.

The mass had evidently been pushed up from below, because, while the ice itself was perfectly white and colourless, it was covered at the surface by a layer of dirt which might very likely have concealed it from observation if it had not happened to be broken. There was a good deal of snow higher up—nine inches at the Montanvert—and the weather was fine, with bright sunny days and hard frost at night. This particular part of the bank was in shade all day, and hardly thawed at all. I imagine that the porous detritus forming the surface of the bank was underlain by hard rock (though it did not occur to me at the time to ascertain if it was so, and at what depth), and that the water

resulting from the melting by the sun of the snow above had percolated down to the hard substratum, along which it had run till it reached the place where the bare earth above it no longer protected it from radiation, and it then cooled and crystallised in this curious way, pushing itself up by expansion in so doing, each layer being the work of one night's frost. If this is correct, it is not difficult to understand what I assume to be the comparative rarity of this form of ice, since it would be seldom that all the necessary conditions would co-exist.

May I add, as the result of seven seasons' experience, that no one who has not tried it knows the charm of Switzerland in October. It is too late, of course, for high ascents, and the flowers are nearly gone; but an ordinary visitor, so long as he avoids the mists and clouds of the lowlands, by keeping at an elevation of three thousand feet and upwards, will find that the brightness and crispness of the air, the *enjoyableness* of the sunshine (which in August can at best be *tolerated*), the purity of the fresh snow, giving grandeur and beauty to lower heights which in summer are mere barren rocks, and the glory of the autumn colouring, not to mention the freedom from the plagues of heat, flies, and tourists, render October in Switzerland the most enjoyable month of the year.

B. WOODD SMITH

Hampstead, October 31

### The Blackness of Tropical Man

A DECISIVE paper on the subject would have to be prepared elsewhere, but Hindostan presents an excellent field for amassing information with regard to the effects of an extraordinarily powerful sun on the human frame's exterior. In a very interesting article in *NATURE* for August 21 last (p. 401), "Why Tropical Man is Black," the cause is set down to the nerves of the skin being one and all highly sensitive to light, the optic nerves being merely some of those of the epidermis highly specialised by long-inherited modification, and the necessity for placing over them a pigment which will absorb light. Otherwise the intense nerve vibrations from a light of double degree power would soon degrade the tissues of the individual and exhaust his vitality.

It would have been all the better if a little more had been said about the way in which a patch of dark pigment cells round the transparent skin of the nerve endings, to be exalted into a special sense, heighten the rates of vibration; or how the selected tissue, at the same time securing the transmission of heat, as the constant accumulation of heat waves behind it, throws the molecular constituents of the protoplasm "into the highest rates of vibration possibly obtainable with the means at disposal."

Before turning to the experience India affords, it has to be noticed that, taking the centre of Europe as the standard of whiteness, it is not only going south that the population becomes successively blacker, but that there is a dark-skinned tendency in the races lying in the other direction, towards the Polar regions. Besides this, exposure in the bright days of August on the moors in the British Isles has the effect of browning the white skin exposed to light, and making it on the face and hands for a short time only a shade lighter than the lightest Indians. This can only be by the solar rays producing pigment in the skin.

On the contrary, the experience of Europeans in India is that the sun there does not burn; if anything, it rather whitens them and pales the complexion. It is only on certain occasions, when the sun is obscured by rain-clouds, it is cool, and the diffused light is of a particular but unascertained actinic quality, that the skin of a European is sunburnt. One may ride all day in the hottest sun and have no trace of sunburning.

Also were light the sole cause of a protection for the skin being required, this would be supplied by the clothing Europeans invariably have, except on hands and face; and they would be placed in about the same favourable position as the natives, if not more so, as those of the latter of the class of labourers prefer working almost entirely without clothes.

What is dreaded by Europeans all over India, and extending into Afghanistan, is the "Indian sun," when it is elevated more than ten or fifteen degrees above the horizon; and it is chiefly the head which it affects, and which has to be protected by non-conducting materials, forming the strange head-gear of the tropics. The playing of the sun on the rest of the body is disagreeable, but not dangerous.

Light and heat are one and the same, so that the nerves of

sight are only a select number of those with which the skin is full, higher strung; but it is noticeable that, though heat is felt by any nerves of the skin indiscriminately, they are insensible to minute differences of heat, or in the periods of the heat-rays, so that no sense, so to speak, is conveyed by them. That is—though, as we know, all objects reflect as many heat-rays of different kinds as they do visual rays—we are not conscious of their form by a reception and discrimination of the varying periods of the heat-rays; we do not consciously see by heat.

The effect the Indian sun has on European health, sunstroke being said to be the work of a few minutes, shows that the nerves of the skin are sensitive to some rays besides those of light. In fact, the sun's rays of Hindostan must contain rays not found in the sunlight of most other parts of the world, which moreover penetrate the European's white skin tissues and clothing, while the natives can let it beat upon their bared heads with complete impunity.

There has never been a sufficiently minute comparison made between the pure solar diffraction spectrum, from the lowest lines to the highest, of India and that in other countries, such as Great Britain, America, the West Indies, and Australia. In many respects the West India Islands are as tropical as the East Indies, but those who have resided in the former and coming to the latter declare there is some quality they feel in the Indian sun that is absent in the West Indies; they can wear a simple straw hat in the one place, but could not attempt it anywhere throughout India. If the spectra were juxtaposed, it would no doubt be found that groups of rays in some portion of it, whether at the red or the violet end, were present to a much larger extent in the light of the Indian sun than either in Australia or the West Indies. It is of the greatest importance, in order to clear up this question, as well as to science in general, that those who have the means and time should analyse the spectra and give the results.

The only test available is sensation at present, but this is unmistakable, because, in addition to the burning feel of 140° Fahrenheit, there is a peculiarly unpleasant sensation even in the shade, whether it is that of a tree, an umbrella, a thin tent, or even a walled room with a window, if there is no veranda. This can only come from invisible rays to which all but the thickest coverings are pervious, and which the skin and tissues admit freely.

European "colonists" are, happily for themselves, unknown in India, and the race would immediately die out, as it is only by frequent visits to temperate climates that a European can preserve health. But if they did exist it is open to doubt if a white skin would ever become black. It is commonly supposed that the Black Jins of Cochin are converted Hindoos. The difference that a change in dress and diet makes in these is singular, many being termed Portuguese, for example, who are pure natives descended from converts whom the Portuguese for the most part made forcibly.

As a rule, the higher the caste and the higher in the scale a native of India is, the whiter he is; and the lower the caste and hotter the mean temperature of the place, the blacker. But this is not invariably the case, as the outcasts who work in leather in Upper India are rather lighter than some of the Brahmans. However, latitude has most effect, and wherever the sun is hottest all the year round the blacker the natives, down to the equator of heat shown on the atlases. The configuration of the country, however, shows that the shades of colour are due to successive waves of conquest from the north, and the Northern Asiatics, who were nearly white at first, degenerate the farther south they come, and are unfit for labour. A blackness of skin, therefore, confers an immunity from the effects of the sun, so that those having it can labour in the heat in a way that would soon cause the lighter races to give in.

Black radiates quicker than white, and though black coats are by no means unknown to Europeans in India, who are as often in those as in coats of any other colour, the black skin of the labourer would throw off accumulated heat much more quickly than if white, and perhaps in a ratio worth calculating. This must be one of the reasons; and it may be noticed that the exterior of buildings is frequently tinted a slate colour with this view, in India, instead of being whitewashed.

Still a more ready dissipation of heat is not the only advantage imparted by a pigmentary blackness in the human skin; and it is to be inferred that the real protection consists in there being a few of the invisible solar rays of the spectrum in tropical light injurious to man, which nevertheless possess unusual